



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Lighting System Upgrades and Maintenance

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13W Twin-tube Compact Fluorescent





13W Twin-tube Compact Fluorescent

- Problems
 1. EOL (end of life failure)
 2. Delay when starting
- Solutions
 1. Retrofit fixture to 4-Pin lamp and ballast
 2. Use 2-Pin E-start lamp



26W Double Twin Tube





26W Double Twin Tube

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 1. Retrofit fixture to 4-Pin lamp and ballast
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1000W Metal Halide





1000W Metal Halide

- Problems
 1. Lumen maintenance
 2. Non passive failure
 3. Color shift over life
- Solutions
 1. Pulse start retrofit
 2. Protected lamp
 3. Group re-lamping



Metal Halide Fresnel downlight





Metal Halide Fresnel downlight

- Problems
 1. Color shift lamp to lamp
 2. Poor CRI
- Solutions
 1. Group re-lamping
 2. Ceramic metal halide (CRI)



Metal Halide Downlight, open rated





Metal Halide Downlight, open rated

- Problems

1. Color shift with old lamps
2. Requires expensive open rated lamp
3. Poor color renderings
4. Creates striations on the floor of wall

- Solutions

1. Group re-lamp
2. Open rated lamps are only solution here
3. Ceramic Metal Halide
4. Use a coated lamp, this softens this effect



High Pressure Sodium (HPS)





HPS Wallpack





High Pressure Sodium (HPS)

- Problems
 1. Life greater than 24,000 hours
 2. Yellow light with poor CRI
 3. Cycling at end of life
- Solutions
 1. Use long life version that gives 40,000 hours
 2. HPS retro-fit lamp to Metal Halide white light
 3. Non-cycle lamp technology



Exit sign





Exit Sign

- Problems
 1. Short lamp life
 2. Bulky battery pack for incandescent / fluorescent operation
 3. High energy consumption
- Solutions
 1. LED Exit Sign
 2. LED Exit Sign
 3. LED Exit Sign



400W Metal Halide Highbay





400W Metal Halide Highbay

- Problems

1. Color shift
2. Color Rendering
3. Lumen Maintenance
4. Hot Restrike
5. Energy Consumption

- Solutions

1. Group re-lamping
2. Ceramic Metal Halide
3. Pulse start technology
4. Pulse start technology
5. Pulse start / WM lamps

*** High output Linear Fluorescent Systems are another solution but require a complete lighting system retro-fit**



F34 or F40/WM T12 Toffer





F34 or F40/WM T12 Strip





F34 or F40/WM T12 Troffer





F34 or F40/WM T12 Troffers - Strips

- Problems
 1. Energy consumption
 2. Poor lumen maintenance
 3. Poor color
 4. Can't be dimmed
 5. Life needs to be longer than 20,000 hours
 6. Disposal
- Solutions
 1. T8 retrofit with electronic ballast
 2. T8 systems have 95% LM
 3. T8 CRI up to 86
 4. Dimming ballasts available
 5. XL versions of T8 lamp available, 36,000 hour life (at 12 hours per start)
 6. Recycle or TCLP Compliant



Summary

- Look for T12 retrofit opportunities
- Use LED Exit Sign
- Planned Replacement
 - Fluorescent Systems
 - HID Systems



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Questions?